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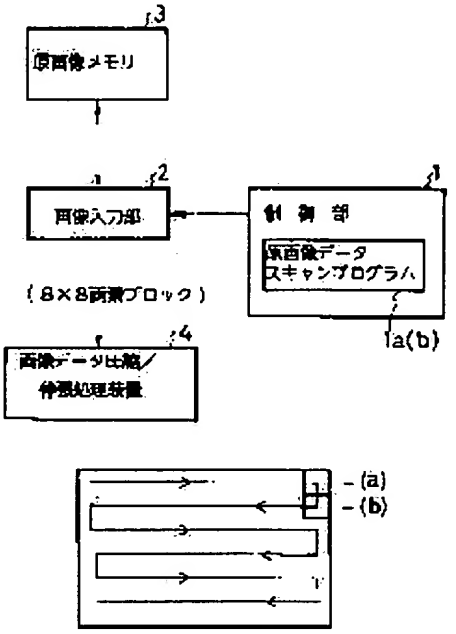
(54) SCANNING METHOD FOR ORIGINAL IMAGE DATA

(57) Abstract:

PURPOSE: To reduce a difference in original image data between adjacent blocks and to improve compression efficiency for encoding by scanning the blocks of original image data stored in a storage part alternately in a specific direction and its reverse direction.

CONSTITUTION: In the case of inputting a picture element block in each prescribed compression unit from an original image memory 3 to a picture input part 2, an original image is horizontally scanned from a block on the upper left end of the image in the right direction in accordance with an original image data scanning program 1a stored in a control part 1, and when the scanning reaches the right end, the succeeding block line is horizontally scanned from the right end block in the left direction. Since the right direction scanning and left direction scanning are alternately repeated, original picture data reducing a difference between adjacent blocks are outputted from the input part 2 to an image data compressing/extending processor 4 to execute encoding having high compression efficiency.



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CLAIMS

[Claim(s)]
[Claim 1] The subject-copy image data scan method characterized by carrying out the scan of the block of the subject-copy image data of the aforementioned storage circles to the opposite direction of the specific direction and the aforementioned specific direction by turns in the subject-copy image data scan method of carrying out the scan of the aforementioned subject-copy image data per block from the storage section in which subject-copy image data were stored, and reading the aforementioned subject-copy image data.
[Claim 2] The subject-copy image data scan method characterized by turning the block of the subject-copy image data of the aforementioned storage circles in the direction of the diagonal line, and carrying out a scan to right and left zigzag a center [the aforementioned diagonal line] in the subject-copy image data scan method of carrying out the scan of the aforementioned subject-copy image data per block from the storage section in which subject-copy image data were stored, and reading the aforementioned subject-copy image data.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] this invention relates to the subject-copy image data scan method which can start the subject-copy image data scan method at the time of reading and compressing image data, especially can raise the compressibility of data using the correlation of a picture in the image data compression / extension processor which performs compression/extension of digital static-image data.
[0002]
[Description of the Prior Art] There were image data compression / an extension processor of the JPEG (Joint Photographic Expert Group) method which performs the decryption for coding for carrying out compression transmission of the image data and picture extension as conventional image data compression / extension processor. The image data compression / extension processor of a JPEG method are explained using drawing 6 . Drawing 6 is the configuration block view of the image data compression / extension processor of a JPEG method.
[0003] The image data compression / extension processor of a JPEG method The coding machine 10 which used DCT as the base, and the decryption machine 20 which used DCT as the base, the memory 32 by the side of the coding machine 10 (a), and the memory by the side of the decryption machine 20 (b) -- 33 -- memory -- (-- a --) -- 32 -- from -- memory -- (-- b --) -- 33 -- compressed data -- transmitting -- a transmission line -- 34 -- quantization -- the time -- using -- having -- quantization -- a table -- 35 -- coding - a decryption -- the time -- using -- having -- coding -- a table -- 36 -- from -- constituting -- having -- **** .
[0004] Furthermore, in the coding machine 10, a DCT operation means 11 to perform a DCT (Discrete Cosine Transform) operation, the quantizer 12 to quantize, and the entropy-code-modulation machine 13 which performs entropy code modulation are formed.
[0005] Moreover, in the decryption machine 20, the entropy decryption machine 23 which performs an entropy decryption of compressed data, the quantizer 22 which performs reverse quantization, and an IDCT operation means 21 to perform a reverse DCT (IDCT) operation are established.
[0006] In a transmitting side, operation in image data compression / extension processor inputs a subject-copy image, and performs a DCT operation with the DCT operation means 11 in the coding machine 10, it quantizes using the quantization table 35 by the quantizer 12, the entropy-code-modulation machine 13 performs entropy code modulation (here Huffman coding) using the coding table 36, and a parameter and code data are stored in memory (a) 32. and -- a transmission line -- 34 -- minding -- a transmitting side -- memory -- (-- a --) -- 32 -- from -- a receiving side -- memory -- (-- b --) -- 33 -- a parameter -- code data -- transmitting -- having -- memory -- (-- b --) -- 33 -- storing -- having .
[0007] In a receiving side, a parameter and code data are incorporated in the decryption machine 20. The entropy decryption machine 23 performs an entropy decryption using the coding table 36. Reverse quantization is performed for the decrypted data using the quantization table 35 by the quantizer 22. A reverse DCT (IDCT) operation is performed with the IDCT operation means 21, and a picture is reproduced (December, 1991 issue p160 written by interface "international [of a color static image] standard coding method" Toshiaki Endo - p182 reference).
[0008] Next, the DCT conversion and Huffman coding in the image data compression / extension processor of the above-mentioned composition are explained using drawing 7 and drawing 8 . The Huffman coding method is used for the method of entropy code modulation in the image data compression / extension processor of a JPEG method. Drawing 7 is explanatory drawing of DCT conversion, and drawing 8 is explanatory drawing of Huffman coding.
[0009] In the DCT operation means 11 of image data compression / extension processor, the subject-copy image data read per 8x8-pixel block perform a DCT operation, and are changed into DCT conversion data. As shown in drawing 7 , the block of subject-copy image data is changed into the array of 8x8 of the difference (AC component) of the average (DC

component) of 64 pixels, and the average. In the block shown in drawing 7 , DC component is 260.
[0010] Next, in the entropy-code-modulation machine 13, it quantizes to the data by which DCT conversion was carried out, and Huffman coding which transposes two or more DCT conversion data to a 2-16-bit bit pattern is performed. About DC component, Huffman coding is performed using the value which lengthened this DC component value (B), i.e., A-B, (difference DC value) from last (pre-block) DC component value (A). since a static image generally has the property that it is rare for the average with an adjoining block to change a lot -- difference -- DC value turns into a value near 0 moreover, difference -- a compression efficiency is better as DC value is small
[0011] Next, the conventional subject-copy image data scan method at the time of incorporating subject-copy image data to the image data compression / extension processor of the above-mentioned composition is concretely explained using drawing 9 . Drawing 9 is the configuration block view of the conventional subject-copy image data scan means. The conventional subject-copy image data scan means outputs subject-copy image data to above-mentioned image data compression / extension processor 4 per 8x8 pixel block, and consists of subject-copy image memory 3 which stores subject-copy image data temporarily, the picture input section 2 which reads data from the subject-copy image memory 3, and a control section 1 which directs the turn (scanning method) of reading image data into the picture input section 2.
[0012] Moreover, a control section 1 has subject-copy image data scan program 1c which specified the scanning method of subject-copy image data, starts subject-copy image data scan program 1c, and controls the picture input section 2.
[0013] Namely, the subject-copy image data read with the scanner etc. are once stored in the subject-copy image memory 3. A control section 1 starts picture data scan program 1c, and takes out directions to the picture input section 2. the picture input section 2 According to the order of the address specified by picture data scan program 1c, subject-copy image data are incorporated from the subject-copy image memory 3 to image data compression / extension processor for every 8x8-pixel block, and the above-mentioned compression processing is performed.
[0014] Here, the outline of the conventional subject-copy image data scan method specified by picture data scan program 1c is explained using drawing 10 . Drawing 10 is explanatory drawing showing the conventional subject-copy image data scan method. As shown in drawing 10 , after reading data horizontally from the block at the upper left of a subject-copy image for every block and completing all readings of the block of eye one train, the conventional subject-copy image data scan method reads the block of eye two trains from a left end, and reads it horizontally one by one to the block at the lower right of the lowest train similarly.
[0015] Next, it explains that processing of subject-copy image data scan program 1c in the conventional subject-copy image data scan method flows using drawing 11 and drawing 12 . Drawing 11 is explanatory drawing showing the block composition of subject-copy image data which carries out a scan by the conventional subject-copy image data scan method, and drawing 12 is the flow chart view showing the flow of processing of subject-copy image data scan program 1c which carries out the scan of the subject-copy image data of drawing 11 using the conventional subject-copy image data scan method. In addition, by drawing 11 and drawing 12 , subject-copy image data shall consist of blocks Bi and j (1 <=i<=m, 1 <=j<=n) of an mxn individual, and the block counts m and n are explained as what is set up beforehand.
[0016] The block counts m and n are read first (100), and 1 is substituted for the conventional subject-copy image data scan method at i (102). Next, 1 is substituted for j (110) and they are Blocks Bi and j. It reads (120), 1 is added to j (122), j is compared with n (124), when j is below n, it returns to processing 120 and reading of a block is repeated. On the other hand, in processing 124, j adds 1 to i, when larger than n (130), and if it returns to processing 110, reading of the following block line is repeated and i becomes large from m when i is below m, the scanning and processing of subject-copy image data will be ended.
[0017]
[Problem(s) to be Solved by the Invention] however, by the above-mentioned conventional picture data scan method As shown in drawing 10 , since the block at the right end of a certain train (e) and the block at the left end of the following train (f) do not adjoin, they do not have a correlation. the difference which lengthened DC value of a block (f) from DC value of a block (e) -- DC value did not turn into a small value, but since the phenomenon in which a correlation is lost appeared whenever the scan of one train moreover finishes, there was a trouble that the compression efficiency of image data will fall
[0018] In view of the above-mentioned actual condition, it succeeded in this invention, and it relates to the subject-copy image data scan method which can raise the compression efficiency of image data by reading the block which always adjoined using the correlation of a picture.
[0019]
[Means for Solving the Problem] Invention according to claim 1 for solving the trouble of the above-mentioned conventional example is characterized by carrying out the scan of the block of the subject-copy image data of the

aforementioned storage circles to the opposite direction of the specific direction and the aforementioned specific direction by turns in the subject-copy image data scan method of carrying out the scan of the aforementioned subject-copy image data per block from the storage section in which subject-copy image data were stored, and reading the aforementioned subject-copy image data.
[0020] Invention according to claim 2 for solving the trouble of the above-mentioned conventional example is characterized by to turn the block of the subject-copy image data of the aforementioned storage circles in the direction of the diagonal line, and to carry out a scan to right and left zigzag a center [the aforementioned diagonal line] in the subject-copy image data scan method of carrying out the scan of the aforementioned subject-copy image data per block from the storage section in which subject-copy image data were stored, and reading the aforementioned subject-copy image data.
[0021]
[Function] Since it is considering as the subject-copy image data scan method of carrying out the scan of the block of the subject-copy image data of storage circles to the specific direction and its opposite direction by turns, and reading subject-copy image data per block according to invention according to claim 1 An adjoining block can be read continuously, it is between contiguity blocks, and since the difference of subject-copy image data is small, the compression efficiency in the case of coding in the picture compression process by the JPEG method can be raised.
[0022] Since it is considering as the subject-copy image data scan method of turning the block of the subject-copy image data of storage circles in the direction of the diagonal line, it carrying out a scan to right and left zigzag a center [the diagonal line], and reading subject-copy image data per block according to invention according to claim 2 An adjoining block can be read continuously, it is between contiguity blocks, and since the difference of subject-copy image data is small, the compression efficiency in the case of coding in the picture compression process by the JPEG method can be raised.
[0023]
[Example] It explains referring to a drawing about one example of this invention. Drawing 1 is the configuration block view of the subject-copy image data scan means for realizing the subject-copy image data scan method concerning one example of this invention. In addition, the same sign is attached and explained about the portion which takes the same composition as drawing 9 .
[0024] As the subject-copy image data scan means of this example is shown in drawing 1 , as the same portion as the conventional composition A control section 1, It consists of the picture input section 2 and subject-copy image memory (storage section) 3. Unlike the conventional subject-copy image data scan program 1c shown in drawing 9 , as a feature portion of this example, the subject-copy image data scan programs 1a and 1b are the programs to which the scanning and processing shown in drawing 2 or drawing 3 are made to carry out.
[0025] Since each part of the subject-copy image data scan means of this example is the same as that of the conventional subject-copy image data scan means shown in drawing 9 almost, processing by the subject-copy image data scan programs 1a and 1b which are the feature portions of this example is carried out to explaining preponderantly, and an intermediary omits explanation into other portions. In addition, 8x8-pixel Grock read in the picture input section 2 is incorporated by the image data compression / extension processor shown in drawing 6 .
[0026] Next, before explaining concretely about the subject-copy image data scan programs 1a and 1b of this example, the outline of the 1st and the subject-copy image data scan method of the 2nd example is explained using drawing 2 and 3. Drawing 2 is explanatory drawing showing the subject-copy image data scan method (the subject-copy image data scan method of the 1st example) by subject-copy image data scan program 1a, and drawing 3 is explanatory drawing showing the subject-copy image data scan method (the subject-copy image data scan method of the 2nd example) by subject-copy image data scan program 1b.
[0027] First, without being intermittent in an adjoining block, as shown in drawing 2 and 3, the 1st and the subject-copy image data scan method of the 2nd example read a 8x8-pixel block in succession altogether, and go.
[0028] Moreover, although it succeeds in compression/extension processing with the image data compression / extension processor shown in drawing 6 , it is necessary to write the image data obtained by the 1st and the subject-copy image data scan method of the 2nd example in the elongated image data 1st and the image memory which displays per block in the same order as the order of a scan of the 2nd example. Now, the picture before compression and the picture of the same composition can be acquired.
[0029] As shown in drawing 2 , the subject-copy image data scan method of the 1st example Make 8x8 pixels into 1 block, and the picture input means 2 is horizontal per block, on the other hand, carry out the scan of the image data in the subject-copy image memory 3 to ** (right in drawing), and subject-copy image data are read. If it finishes reading a

horizontal block next, as it is, will move perpendicularly (down in drawing) by 1 block, and it is horizontal, and will carry out a scan to an opposite direction (left in drawing), and subject-copy image data will be read. Furthermore, if it finishes reading a horizontal block, as it is, it will move perpendicularly (down in drawing) by 1 block, and it is horizontal, and on the other hand, a scan will be carried out to ** (right in drawing), and subject-copy image data will be read. The processing after this serves as a repeat of the above-mentioned processing.

[0030] if it explains concretely using drawing 11 -- the block (Bi and j) of subject-copy image data -- B -- 1 and 1B -- 1 and 2B -- 1, 3, --, B1 and n If a scan is carried out B-2, n, B-2, n-1, --, B-2, and 1 a scan -- carrying out -- further -- B3 -- 3 and 1B -- 3 and 2B -- 3, 3, --, B3 and n if a scan is carried out and the number of the blocks of the last stage is even (m : even number) -- Bm, n, Bm, n-1, --, Bm, and 1 A scan is carried out. [next,]

[0031] Since according to the subject-copy image data scan method of the 1st example a scan is carried out so that the block (a) and block (b) with which drawing 2 adjoins may be read continuously for example the difference of DC component which lengthened DC component of a block (b) from DC component of a block (a) at the time of DC Huffman coding -- a value -- a small value -- it can carry out -- therefore, the difference of the DC component, since it can encode with a value The amount of data for compression can be stopped and it is effective in the ability to raise the compression efficiency of the static-image data of a JPEG method.

[0032] In addition, although it is made to perform a horizontal scan to the forward direction and an opposite direction by turns on the basis of a horizontal scan by the subject-copy image data scan method of the 1st example, you may be made to perform a vertical scan to the forward direction and an opposite direction by turns on the basis of a vertical scan.

[0033] As shown in drawing 3 , the subject-copy image data scan method of the 2nd example makes 8x8 pixels 1 block for the image data in the subject-copy image memory 3, and the picture input means 2 reads subject-copy image data in the upper left in drawing focusing on the diagonal line towards the direction of the diagonal line at right and left in a block unit, while [lower right / in drawing / scan / zigzag].

[0034] if it explains concretely using drawing 11 -- the block (Bi and j) of subject-copy image data -- B -- 1 and 1B -- 1, 2, B-2, 1, and B -- 3, 1, B-2, 2, and B -- 1 and 3B -- 1, 4, --, Bm-1, n, Bm, n-1, Bm, and n A scan is carried out in order.

[0035] Since according to the subject-copy image data scan method of the 2nd example a scan is carried out so that the block (c) and block (d) with which drawing 3 adjoins may be read continuously for example the difference of DC component which lengthened DC component of a block (d) from DC component of a block (c) at the time of DC Huffman coding -- a value -- a small value -- it can carry out -- therefore, the difference of the DC component, since it can encode with a value The amount of data for compression can be stopped and it is effective in the ability to raise the compression efficiency of the static-image data of a JPEG method.

[0036] Next, the content of processing of the subject-copy image data scan program which realizes the 1st and the subject-copy image data scan method of the 2nd example is explained. First, it explains that processing of subject-copy image data scan program 1a in the subject-copy image data scan method of the 1st example flows using drawing 4 and drawing 11 . Drawing 4 is the flow chart view showing the flow of processing of subject-copy image data scan program 1a which carries out the scan of the subject-copy image data of drawing 11 using the subject-copy image data scan method of the 1st example. In addition, drawing 4 explains the block counts m and n as usual as what is set up beforehand.

[0037] As shown in drawing 4 , the block counts m and n are read first (200), and 1 is substituted for the subject-copy image data scan method of the 1st example at i (202). Next, as processing which carries out a scan rightward, 1 is substituted for j (210) and they are Blocks Bi and j. It judges whether j is larger than n (224), it reads (220) and 1 is added to j (222), when j is below n, it returns to processing 220 and the scan to the right is repeated, and j adds 1 to i, when larger than n (230).

[0038] And it judges whether i is larger than m (232), i ends the scanning and processing of subject-copy image data, when larger than m, n is substituted for j as processing which carries out a scan leftward when i is below m (240), and they are Blocks Bi and j. It reads (250) and 1 is subtracted from j (252). Next, it judges whether j is smaller than 1 (254), and if it returns to processing 250, a leftward scan is repeated and j becomes small from 1 when j is one or more, 1 will be added to i (260). And it judges whether i is larger than m (262), when i is below m, it returns to processing 210 and the scan of the right of the following block line is performed, and i ends the scanning and processing of subject-copy image data, when larger than m.

[0039] Next, it explains that processing of subject-copy image data scan program 1b in the subject-copy image data scan method of the 2nd example flows using drawing 5 and drawing 11 . Drawing 5 is the flow chart view showing the flow of processing of subject-copy image data scan program 1b which carries out the scan of the subject-copy image data of drawing 11 using the subject-copy image data scan method of the 2nd example. In addition, drawing 5 explains the block

counts m and n as usual as what is set up beforehand.
[0040] First, the block counts m and n are read (300), 1 is substituted for the subject-copy image data scan method of the 2nd example at i and j (302), and they are Blocks Bi and j. It reads (304). Next, when 1 is added to j (310), j is compared with n as processing which carries out 1 block scan rightward (312) and j is below n, they are Blocks Bi and j. It reads (314).
[0041] Next, judge whether the value of i is 1 (316), and when i is 1 As processing which carries out a scan in the direction of the lower left, add 1 to i, subtract 1 from j (320), compare i with m (322), and when i is below m When j is furthermore compared with 1 (324) and j is one or more, they are Blocks Bi and j. It reads (326), it returns to processing 320, and the scan to the direction of the lower left is repeated.
[0042] In addition, it moves to the processing which subtracts i to 1 since it is the case where a scanning position reaches [i] the soffit of subject-copy image data in processing 322 when larger than m, adds 1 to j, returns a scanning (328) position, flies to processing 310, and carries out 1 block scan rightward.
[0043] Moreover, it moves to the processing which subtracts i to 1 since it is the case where a scanning position arrives at [j] the left end of subject-copy image data in processing 324 when smaller than 1, adds 1 to j, returns a scanning (329) position, flies to processing 340, and carries out 1 block scan to down.
[0044] And in processing 316, when i is not 1 As processing which carries out a scan in the direction of the upper right, subtract 1 from i and 1 is added to j (330). When i is compared with 1 (332), j is further compared with n when i is one or more (334), and j is below n, they are Blocks Bi and j. It reads (336), it returns to processing 330, and the scan to the direction of the upper right is repeated.
[0045] In addition, in processing 332, since i is the case where a scanning position reaches the upper limit of subject-copy image data when smaller than 1, it moves to the processing which adds 1 to i, subtracts 1 from j, returns a scanning (338) position, flies to processing 310, and carries out 1 block scan rightward.
[0046] Moreover, in processing 334, since j is the case where a scanning position arrives at the right end of subject-copy image data when larger than n, it moves to the processing which adds 1 to i, subtracts 1 from j, returns a scanning (339) position, flies to processing 340, and carries out 1 block scan to down.
[0047] In processing 312 j and when larger than n Since it is the case where a scanning position arrives at the right end of subject-copy image data, as processing which subtracts 1 from j, returns a scanning (313) position, and next carries out 1 block scan to down 1 is added to i (340), i is compared with m (342), and i ends the scanning and processing of subject-copy image data, when larger than m.
[0048] On the other hand, when i is below m in processing 342, they are Blocks Bi and j. It reads (344), when j is 1, it flies to processing 330, and it moves to the processing which moves to the processing which carries out a scan in the direction of the upper right, flies to processing 320 when j is not 1, and carries out a scan in the direction of the lower left.

[0049] the time of DC Huffman coding in compression process since according to the subject-copy image data scan method of this example the contiguity block with a correlation is continuously read by the scanning method shown in drawing 2 and drawing 3 and the JPEG method is made to perform compression processing -- the difference of DC component -- since a value is made to a small value, it is effective in the ability to be able to raise a compression efficiency
[0050]
[Effect of the Invention] Since it is considering as the subject-copy image data scan method of carrying out the scan of the block of the subject-copy image data of storage circles to the specific direction and its opposite direction by turns, and reading subject-copy image data per block according to invention according to claim 1 An adjoining block can be read continuously and it is effective in the ability to raise [are between contiguity blocks, and] the compression efficiency in the case of coding in the picture compression process by the JPEG method, since the difference of subject-copy image data is small.
[0051] Since it is considering as the subject-copy image data scan method of turning the block of the subject-copy image data of storage circles in the direction of the diagonal line, it carrying out a scan to right and left zigzag a center [the diagonal line], and reading subject-copy image data per block according to invention according to claim 2 An adjoining block can be read continuously and it is effective in the ability to raise [are between contiguity blocks, and] the compression efficiency in the case of coding in the picture compression process by the JPEG method, since the difference of subject-copy image data is small.

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TECHNICAL FIELD

[Industrial Application] this invention relates to the subject-copy image data scan method which can start the subject-copy image data scan method at the time of reading and compressing image data, especially can raise the compressibility of data using the correlation of a picture in the image data compression / extension processor which performs compression/extension of digital static-image data.

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EFFECT OF THE INVENTION

[Effect of the Invention] In invention according to claim 1, it is considering as the subject-copy image data scan method of carrying out the scan of the block of the subject-copy image data of storage circles to the specific direction and its opposite direction by turns, and reading subject-copy image data per block. Therefore, an adjoining block can be read continuously and it is effective in the ability to raise [are between contiguity blocks, and] the compression efficiency in the case of coding in the picture compression process by the JPEG method, since the difference of subject-copy image data is small.

[0051] In invention according to claim 2, it is considering as the subject-copy image data scan method of turning the block of the subject-copy image data of storage circles in the direction of the diagonal line, it carrying out a scan to right and left zigzag a center [the diagonal line], and reading subject-copy image data per block. Therefore, an adjoining block can be read continuously and it is effective in the ability to raise [are between contiguity blocks, and] the compression efficiency in the case of coding in the picture compression process by the JPEG method, since the difference of subject-copy image data is small.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] however, by the above-mentioned conventional picture data scan method As shown in drawing 10 , since the block at the right end of a certain train (e) and the block at the left end of the following train (f) do not adjoin, they do not have a correlation. the difference which lengthened DC value of a block (f) from DC value of a block (e) -- DC value did not turn into a small value, but since the phenomenon in which a correlation is lost appeared whenever the scan of one train moreover finishes, there was a trouble that the compression efficiency of image data will fall

[0018] In view of the above-mentioned actual condition, it succeeded in this invention, and it relates to the subject-copy image data scan method which can raise the compression efficiency of image data by reading the block which always adjoined using the correlation of a picture.

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MEANS

[Means for Solving the Problem] Invention according to claim 1 for solving the trouble of the above-mentioned conventional example is characterized by carrying out the scan of the block of the subject-copy image data of the aforementioned storage circles to the opposite direction of the specific direction and the aforementioned specific direction by turns in the subject-copy image data scan method of carrying out the scan of the aforementioned subject-copy image data per block from the storage section in which subject-copy image data were stored, and reading the aforementioned subject-copy image data.
[0020] Invention according to claim 2 for solving the trouble of the above-mentioned conventional example is characterized by to turn the block of the subject-copy image data of the aforementioned storage circles in the direction of the diagonal line, and to carry out a scan to right and left zigzag a center [the aforementioned diagonal line] in the subject-copy image data scan method of carrying out the scan of the aforementioned subject-copy image data per block from the storage section in which subject-copy image data were stored, and reading the aforementioned subject-copy image data.

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OPERATION

[Function] In invention according to claim 1, it is considering as the subject-copy image data scan method of carrying out the scan of the block of the subject-copy image data of storage circles to the specific direction and its opposite direction by turns, and reading subject-copy image data per block. Therefore, an adjoining block can be read continuously, it is between contiguity blocks, and since the difference of subject-copy image data is small, the compression efficiency in the case of coding in the picture compression process by the JPEG method can be raised.
[0022] In invention according to claim 2, it is considering as the subject-copy image data scan method of turning the block of the subject-copy image data of storage circles in the direction of the diagonal line, it carrying out a scan to right and left zigzag a center [the diagonal line], and reading subject-copy image data per block. Therefore, an adjoining block can be read continuously, it is between contiguity blocks, and since the difference of subject-copy image data is small, the compression efficiency in the case of coding in the picture compression process by the JPEG method can be raised.

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EXAMPLE

[Example] It explains referring to a drawing about one example of this invention. Drawing 1 is the configuration block view of the subject-copy image data scan means for realizing the subject-copy image data scan method concerning one example of this invention. In addition, the same sign is attached and explained about the portion which takes the same composition as drawing 9 .
[0024] As the subject-copy image data scan means of this example is shown in drawing 1 , as the same portion as the conventional composition A control section 1, It consists of the picture input section 2 and subject-copy image memory (storage section) 3. Unlike the conventional subject-copy image data scan program 1c shown in drawing 9 , as a feature portion of this example, the subject-copy image data scan programs 1a and 1b are the programs to which the scanning and processing shown in drawing 2 or drawing 3 are made to carry out.
[0025] Since each part of the subject-copy image data scan means of this example is the same as that of the conventional subject-copy image data scan means shown in drawing 9 almost, processing by the subject-copy image data scan programs 1a and 1b which are the feature portions of this example is carried out to explaining preponderantly, and an intermediary omits explanation into other portions. In addition, 8x8-pixel Grock read in the picture input section 2 is incorporated by the image data compression / extension processor shown in drawing 6 .
[0026] Next, before explaining concretely about the subject-copy image data scan programs 1a and 1b of this example, the outline of the 1st and the subject-copy image data scan method of the 2nd example is explained using drawing 2 and 3. Drawing 2 is explanatory drawing showing the subject-copy image data scan method (the subject-copy image data scan method of the 1st example) by subject-copy image data scan program 1a, and drawing 3 is explanatory drawing showing the subject-copy image data scan method (the subject-copy image data scan method of the 2nd example) by subject-copy image data scan program 1b.
[0027] First, without being intermittent in an adjoining block, as shown in drawing 2 and 3, the 1st and the subject-copy image data scan method of the 2nd example read a 8x8-pixel block in succession altogether, and go.
[0028] Moreover, although it succeeds in compression/extension processing with the image data compression / extension processor shown in drawing 6 , it is necessary to write the image data obtained by the 1st and the subject-copy image data scan method of the 2nd example in the elongated image data 1st and the image memory which displays per block in the same order as the order of a scan of the 2nd example. Now, the picture before compression and the picture of the same composition can be acquired.
[0029] As shown in drawing 2 , the subject-copy image data scan method of the 1st example Make 8x8 pixels into 1 block, and the picture input means 2 is horizontal per block, on the other hand, carry out the scan of the image data in the subject-copy image memory 3 to ** (right in drawing), and subject-copy image data are read. If it finishes reading a horizontal block next, as it is, will move perpendicularly (down in drawing) by 1 block, and it is horizontal, and will carry out a scan to an opposite direction (left in drawing), and subject-copy image data will be read. Furthermore, if it finishes reading a horizontal block, as it is, it will move perpendicularly (down in drawing) by 1 block, and it is horizontal, and on the other hand, a scan will be carried out to ** (right in drawing), and subject-copy image data will be read. The processing after this serves as a repeat of the above-mentioned processing.
[0030] if it explains concretely using drawing 11 -- the block (Bi and j) of subject-copy image data -- B -- 1 and 1B -- 1 and 2B -- 1, 3, --, B1 and n If a scan is carried out B-2, n, B-2, n-1, --, B-2, and 1 a scan -- carrying out -- further -- B -- 3 and 1B -- 3 and 2B -- 3, 3, --, B3 and n if a scan is carried out and the number of the blocks of the last stage is even (m : even number) -- Bm, n, Bm, n-1, --, Bm, and 1 A scan is carried out. [next,]
[0031] Since according to the subject-copy image data scan method of the 1st example a scan is carried out so that the block (a) and block (b) with which drawing 2 adjoins may be read continuously for example the difference of DC component which lengthened DC component of a block (b) from DC component of a block (a) at the time of DC Huffman

coding -- a value -- a small value -- it can carry out -- therefore, the difference of the DC component, since it can encode with a value The amount of data for compression can be stopped and it is effective in the ability to raise the compression efficiency of the static-image data of a JPEG method.
[0032] In addition, although it is made to perform a horizontal scan to the forward direction and an opposite direction by turns on the basis of a horizontal scan by the subject-copy image data scan method of the 1st example, you may be made to perform a vertical scan to the forward direction and an opposite direction by turns on the basis of a vertical scan.
[0033] As shown in drawing 3 , the subject-copy image data scan method of the 2nd example makes 8x8 pixels 1 block for the image data in the subject-copy image memory 3, and the picture input means 2 reads subject-copy image data in the upper left in drawing focusing on the diagonal line towards the direction of the diagonal line at right and left in a block unit, while [lower right / in drawing / scan / zigzag].
[0034] if it explains concretely using drawing 11 -- the block (Bi and j) of subject-copy image data -- B -- 1 and 1B -- 1, 2, B-2, 1, and B -- 3, 1, B-2, 2, and B -- 1 and 3B -- 1, 4, --, Bm-1, n, Bm, n-1, Bm, and n A scan is carried out in order.
[0035] Since according to the subject-copy image data scan method of the 2nd example a scan is carried out so that the block (c) and block (d) with which drawing 3 adjoins may be read continuously for example the difference of DC component which lengthened DC component of a block (d) from DC component of a block (c) at the time of DC Huffman coding -- a value -- a small value -- it can carry out -- therefore, the difference of the DC component, since it can encode with a value The amount of data for compression can be stopped and it is effective in the ability to raise the compression efficiency of the static-image data of a JPEG method.
[0036] Next, the content of processing of the subject-copy image data scan program which realizes the 1st and the subject-copy image data scan method of the 2nd example is explained. First, it explains that processing of subject-copy image data scan program 1a in the subject-copy image data scan method of the 1st example flows using drawing 4 and drawing 11 . Drawing 4 is the flow chart view showing the flow of processing of subject-copy image data scan program 1a which carries out the scan of the subject-copy image data of drawing 11 using the subject-copy image data scan method of the 1st example. In addition, drawing 4 explains the block counts m and n as usual as what is set up beforehand.
[0037] As shown in drawing 4 , the block counts m and n are read first (200), and 1 is substituted for the subject-copy image data scan method of the 1st example at i (202). Next, as processing which carries out a scan rightward, 1 is substituted for j (210) and they are Blocks Bi and j. It judges whether j is larger than n (224), it reads (220) and 1 is added to j (222), when j is below n, it returns to processing 220 and the scan to the right is repeated, and j adds 1 to i, when larger than n (230).
[0038] And it judges whether i is larger than m (232), i ends the scanning and processing of subject-copy image data, when larger than m, n is substituted for j as processing which carries out a scan leftward when i is below m (240), and they are Blocks Bi and j. It reads (250) and 1 is subtracted from j (252). Next, it judges whether j is smaller than 1 (254), and if it returns to processing 250, a leftward scan is repeated and j becomes small from 1 when j is one or more, 1 will be added to i (260). And it judges whether i is larger than m (262), when i is below m, it returns to processing 210 and the scan of the right of the following block line is performed, and i ends the scanning and processing of subject-copy image data, when larger than m.
[0039] Next, it explains that processing of subject-copy image data scan program 1b in the subject-copy image data scan method of the 2nd example flows using drawing 5 and drawing 11 . Drawing 5 is the flow chart view showing the flow of processing of subject-copy image data scan program 1b which carries out the scan of the subject-copy image data of drawing 11 using the subject-copy image data scan method of the 2nd example. In addition, drawing 5 explains the block counts m and n as usual as what is set up beforehand.
[0040] First, the block counts m and n are read (300), 1 is substituted for the subject-copy image data scan method of the 2nd example at i and j (302), and they are Blocks Bi and j. It reads (304). Next, when 1 is added to j (310), j is compared with n as processing which carries out 1 block scan rightward (312) and j is below n, they are Blocks Bi and j. It reads (314).
[0041] Next, judge whether the value of i is 1 (316), and when i is 1 As processing which carries out a scan in the direction of the lower left, add 1 to i, subtract 1 from j (320), compare i with m (322), and when i is below m When j is furthermore compared with 1 (324) and j is one or more, they are Blocks Bi and j. It reads (326), it returns to processing 320, and the scan to the direction of the lower left is repeated.
[0042] In addition, it moves to the processing which subtracts i to 1 since it is the case where a scanning position reaches [i] the soffit of subject-copy image data in processing 322 when larger than m, adds 1 to j, returns a scanning (328) position, flies to processing 310, and carries out 1 block scan rightward.

[0043] Moreover, it moves to the processing which subtracts i to 1 since it is the case where a scanning position arrives at [j] the left end of subject-copy image data in processing 324 when smaller than 1, adds 1 to j, returns a scanning (329) position, flies to processing 340, and carries out 1 block scan to down.

[0044] And in processing 316, when i is not 1 As processing which carries out a scan in the direction of the upper right, subtract 1 from i and 1 is added to j (330). When i is compared with 1 (332), j is further compared with n when i is one or more (334), and j is below n, they are Blocks Bi and j. It reads (336), it returns to processing 330, and the scan to the direction of the upper right is repeated.

[0045] In addition, in processing 332, since i is the case where a scanning position reaches the upper limit of subject-copy image data when smaller than 1, it moves to the processing which adds 1 to i, subtracts 1 from j, returns a scanning (338) position, flies to processing 310, and carries out 1 block scan rightward.

[0046] Moreover, in processing 334, since j is the case where a scanning position arrives at the right end of subject-copy image data when larger than n, it moves to the processing which adds 1 to i, subtracts 1 from j, returns a scanning (339) position, flies to processing 340, and carries out 1 block scan to down.

[0047] In processing 312 j and when larger than n Since it is the case where a scanning position arrives at the right end of subject-copy image data, as processing which subtracts 1 from j, returns a scanning (313) position, and next carries out 1 block scan to down 1 is added to i (340), i is compared with m (342), and i ends the scanning and processing of subject-copy image data, when larger than m.

[0048] On the other hand, when i is below m in processing 342, they are Blocks Bi and j. It reads (344), when j is 1, it flies to processing 330, and it moves to the processing which moves to the processing which carries out a scan in the direction of the upper right, flies to processing 320 when j is not 1, and carries out a scan in the direction of the lower left.

[0049] the time of DC Huffman coding in compression process since according to the subject-copy image data scan method of this example the contiguity block with a correlation is continuously read by the scanning method shown in drawing 2 and drawing 3 and the JPEG method is made to perform compression processing -- the difference of DC component -- since a value is made to a small value, it is effective in the ability to be able to raise a compression efficiency

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[Translation done.]

* NOTICES *

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2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the configuration block view of the subject-copy image data scan means concerning one example of this invention.
[Drawing 2] It is explanatory drawing showing the subject-copy image data scan method of the 1st example.
[Drawing 3] It is explanatory drawing showing the subject-copy image data scan method of the 2nd example.
[Drawing 4] It is the flow chart view showing the flow of processing of subject-copy image data scan program 1a which carries out the scan of the subject-copy image data of drawing 11 using the subject-copy image data scan method of the 1st example.
[Drawing 5] It is the flow chart view showing the flow of processing of subject-copy image data scan program 1b which carries out the scan of the subject-copy image data of drawing 11 using the subject-copy image data scan method of the 2nd example.
[Drawing 6] It is the configuration block view of the image data compression / extension processor of a JPEG method.
[Drawing 7] It is explanatory drawing of DCT conversion.
[Drawing 8] It is explanatory drawing of Huffman coding.
[Drawing 9] It is the configuration block view of the conventional subject-copy image data scan means.
[Drawing 10] It is explanatory drawing showing the conventional subject-copy image data scan method.
[Drawing 11] It is explanatory drawing showing the block composition of subject-copy image data which carries out a scan by the conventional subject-copy image data scan method.
[Drawing 12] It is the flow chart view showing the flow of processing of subject-copy image data scan program 1c which carries out the scan of the subject-copy image data of drawing 11 using the conventional subject-copy image data scan method.
[Description of Notations]
1 -- Control section 1a, 1b, 1c -- Subject-copy image data scan program 2 -- Picture input section, [4 -- Image data compression / extension processor 10 -- Coding machine,] 3 -- Subject-copy image memory [12 -- Quantizer 13 -- entropy-code-modulation machine,] 11 -- DCT operation means [21 -- Reverse DCT operation means 22 -- Quantizer 23 -- Entropy decryption machine 32 -- Memory (a) 33 -- Memory (b) 34 -- Transmission line 35 -- Quantization table 36 -- Coding table] 20 -- Decryption machine

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[Translation done.]

* NOTICES *

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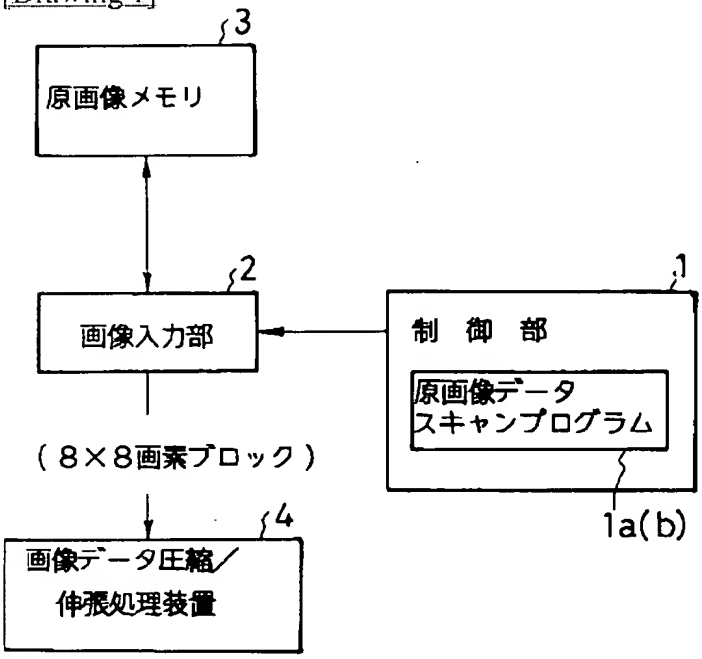
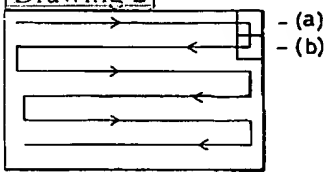
3.In the drawings, any words are not translated.

DRAWINGS

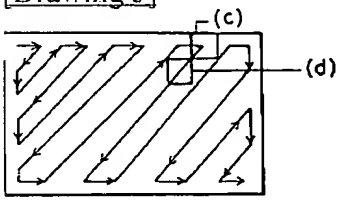
[Drawing 1]



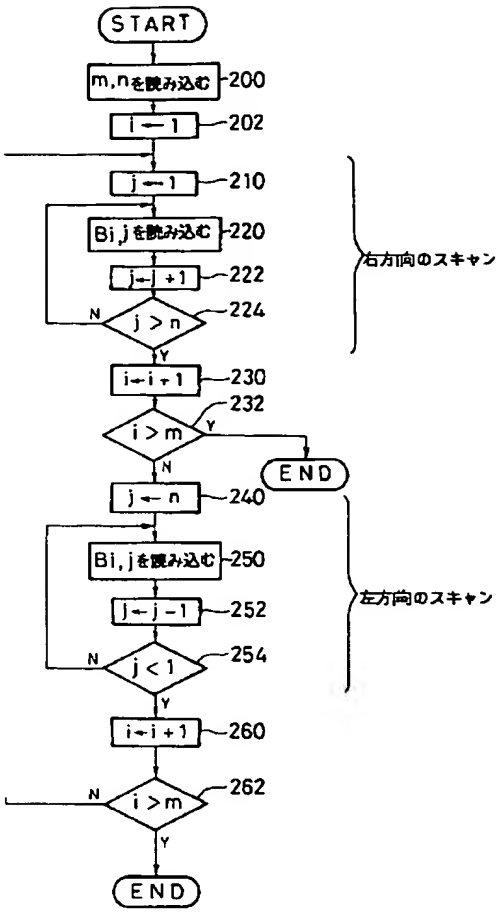
[Drawing 2]



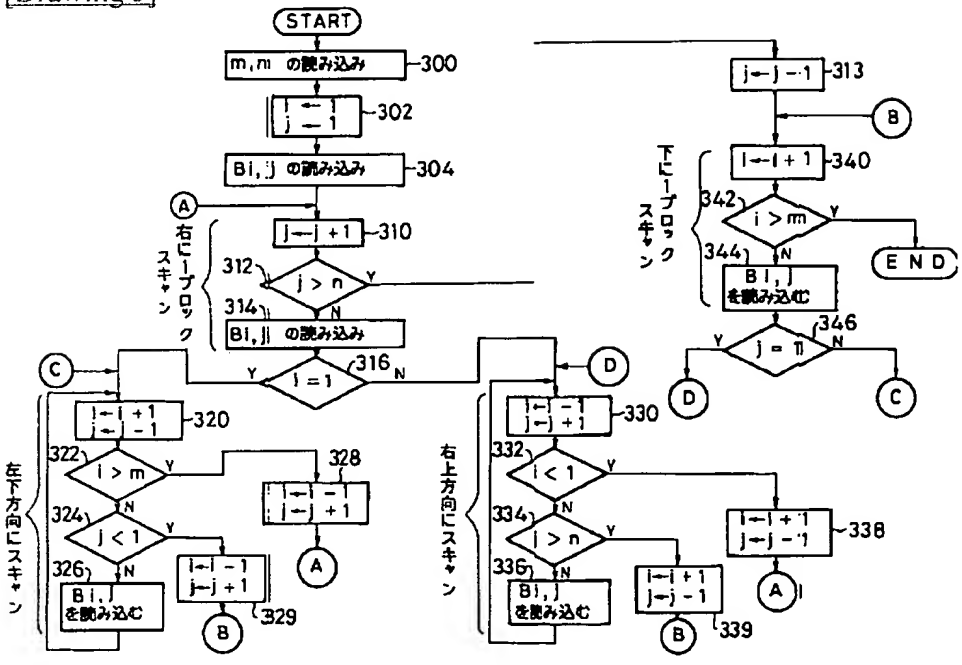
[Drawing 3]



[Drawing 4]



[Drawing 5]



[Drawing 7]

原画像データ

159	153	158	152	140	138	132	132
164	162	162	157	151	142	134	132
167	168	161	160	158	145	139	134
164	168	161	166	162	152	149	141
171	166	158	167	163	162	157	151
173	154	159	170	166	166	162	161
175	169	172	176	174	172	174	166
173	172	175	173	180	181	177	172

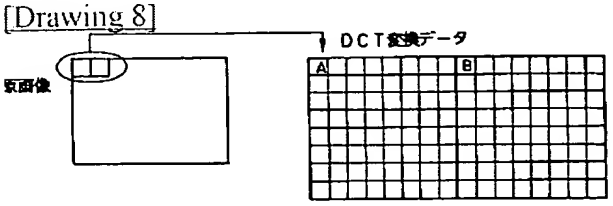
DCT変換

DCT変換データ

260	49	-16	5	2	4	0	1
-79	36	-2	-7	1	-3	-1	-2
0	-8	3	-2	-2	1	5	1
-8	-4	5	-4	1	7	6	-2
-2	-6	-1	0	-4	-1	0	-1
-3	-2	-1	-1	1	2	-5	-1
-4	-1	1	0	0	-2	2	0
1	1	1	1	-1	1	0	0

DC成分

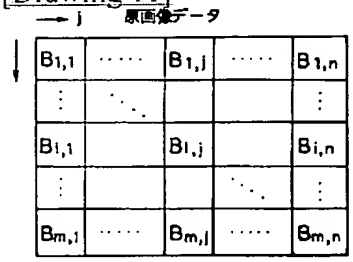
[Drawing 8]



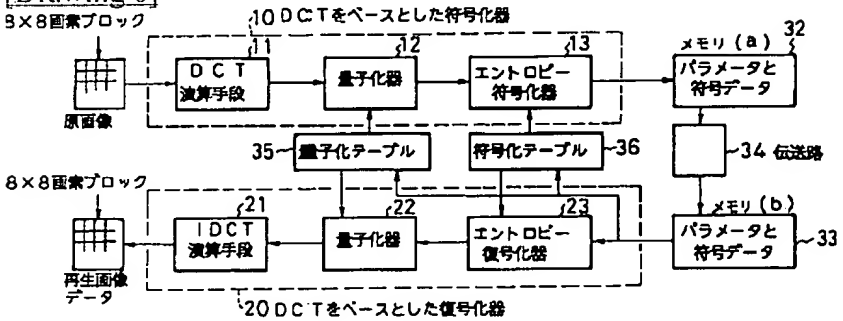
DCハフマン符号化

A（前回DC）−B（今回DC）＝符号化時のDC

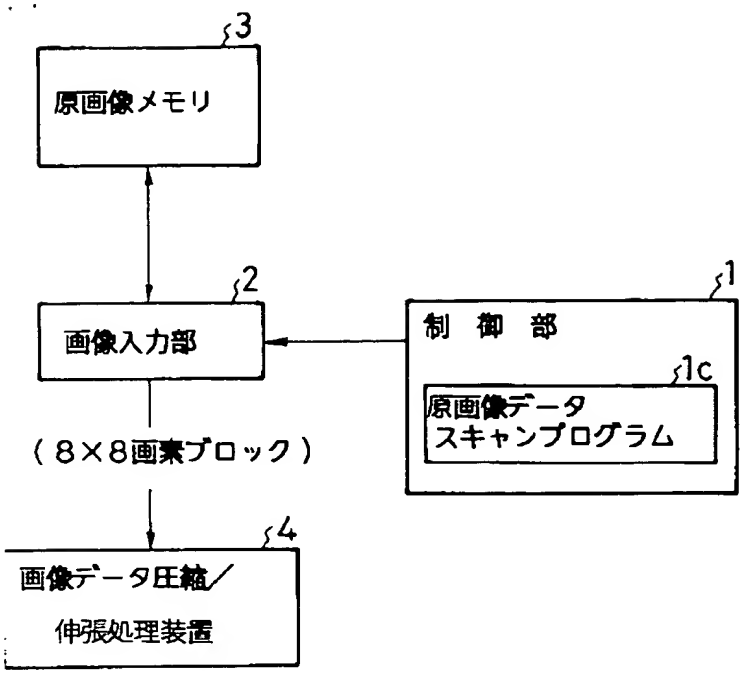
[Drawing 11]



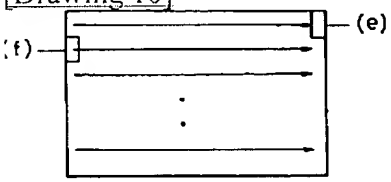
[Drawing 6]



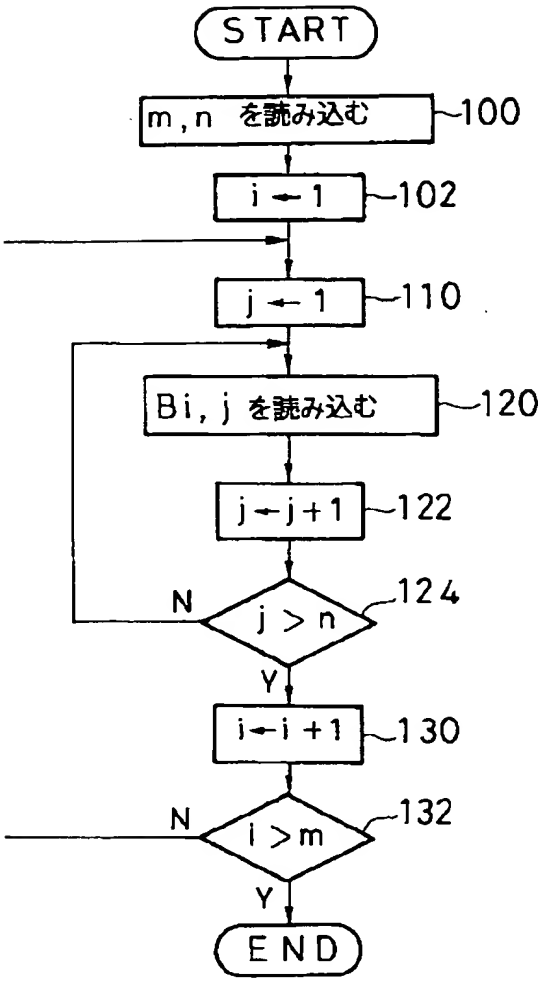
[Drawing 9]



[Drawing 10]



[Drawing 12]



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DOCUMENT-IDENTIFIER: JP 07264591 A

TITLE: SCANNING METHOD FOR ORIGINAL IMAGE DATA

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APPL-NO: JP06075493

APPL-DATE: March 23, 1994

INT-CL (IPC): H04N007/30;G06T009/00 ;H04N001/41 ;H03M007/30 ;H03M007/40

ABSTRACT:

PURPOSE: To reduce a difference in original image data between adjacent blocks and to improve compression efficiency for encoding by scanning the blocks of original image data stored in a storage part alternately in a specific direction and its reverse direction.

CONSTITUTION: In the case of inputting a picture element block in each prescribed compression unit from an original image memory 3 to a picture input part 2, an original image is horizontally scanned from a block on the upper left end of the image in the right direction in accordance with an original image data scanning program 1a stored in a control part 1,

and when the
scanning reaches the right end, the succeeding block line
is horizontally
scanned from the right end block in the left direction.
Since the right
direction scanning and left direction scanning are
alternately repeated,
original picture data reducing a difference between
adjacent blocks are
outputted from the input part 2 to an image data
compressing/extending
processor 4 to execute encoding having high compression
efficiency.

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特開平7－264591

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Ｈ０４Ｎ　1/41	Ｂ			
			Ｈ０４Ｎ　7/133	Ｚ
			Ｇ０６Ｆ　15/66　３３０	Ｈ

審査請求　未請求　請求項の数２　ＦＤ　（全８頁）　最終頁に続く

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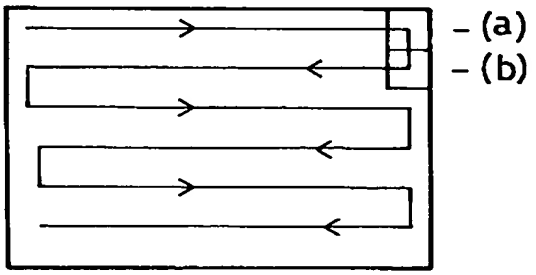
(54)【発明の名称】　原画像データスキャン方法

(57)【要約】　（修正有）

【目的】　静止画像データ圧縮におけるハフマン符号化時の画像の相関関係を利用して、圧縮率を向上させることのできる原画像データスキャン方法を提供する。

【構成】　原画像メモリから圧縮単位の８×８画素のブロックを読み込む際に、制御部１内の原画像データスキャンプログラム１ａに従って、原画像の左上端のブロックから右方向に水平にスキャンし、右端に達したら次のブロックラインは右端のブロックから左方向に水平にスキャンし、右方向スキャンと左方向スキャンとを交互に繰り返す原画像データスキャン方法であり、また、原画像データスキャンプログラム１ｂに従って、原画像の左上端のブロックから原画像データの対角線方向にその対角線を中心に左右交互にジグザグスキャンする原画像データスキャン方法である。



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【特許請求の範囲】

【請求項1】　原画像データが格納された記憶部から前記原画像データをブロック単位にスキャンして前記原画像データを読み取る原画像データスキャン方法において、前記記憶部内の原画像データのブロックを特定方向と前記特定方向の逆方向に交互にスキャンすることを特徴とする原画像データスキャン方法。

【請求項2】　原画像データが格納された記憶部から前記原画像データをブロック単位にスキャンして前記原画像データを読み取る原画像データスキャン方法において、前記記憶部内の原画像データのブロックを対角線方向に向けて前記対角線を中心に左右にジグザグにスキャンすることを特徴とする原画像データスキャン方法。

【発明の詳細な説明】

【0001】

【産業上の利用分野】本発明は、デジタル静止画像データの圧縮／伸張を行う画像データ圧縮／伸張処理装置において、画像データを読み込んで圧縮する際の原画像データスキャン方法に係り、特に画像の相関関係を利用してデータの圧縮率を向上させることができる原画像データスキャン方法に関する。

【0002】

【従来の技術】従来の画像データ圧縮／伸張処理装置としては、画像データを圧縮伝送するための符号化及び画像伸張のための復号化を行うＪＰＥＧ（Joint Photographic Expert Group ）方式の画像データ圧縮／伸張処理装置があった。ＪＰＥＧ方式の画像データ圧縮／伸張処理装置について図６を使って説明する。図６は、ＪＰＥＧ方式の画像データ圧縮／伸張処理装置の構成ブロック図である。

【0003】ＪＰＥＧ方式の画像データ圧縮／伸張処理装置は、ＤＣＴをベースとした符号化器１０と、ＤＣＴをベースとした復号化器２０と、符号化器１０側のメモリ（ａ）３２と、復号化器２０側のメモリ（ｂ）３３と、メモリ（ａ）３２からメモリ（ｂ）３３へ圧縮データを伝送する伝送路３４と、量子化の際に用いられる量子化テーブル３５と、符号化・復号化の際に用いられる符号化テーブル３６とから構成されている。

【0004】更に、符号化器１０内には、ＤＣＴ（Discrete Cosine Transform ）演算を行うＤＣＴ演算手段１１と、量子化を行う量子化器１２と、エントロピー符号化を行うエントロピー符号化器１３とが設けられている。

【0005】また、復号化器２０内には、圧縮データのエントロピー復号化を行うエントロピー復号化器２３と、逆量子化を行う量子化器２２と、逆ＤＣＴ（ＩＤＣＴ）演算を行うＩＤＣＴ演算手段２１とが設けられている。

【0006】画像データ圧縮／伸張処理装置における動作は、送信側においては、原画像を入力し、符号化器１０内のＤＣＴ演算手段１１でＤＣＴ演算を行い、量子化器１２で量子化テーブル３５を用いて量子化を行い、エントロピー符号化器１３で符号化テーブル３６を用いてエントロピー符号化（ここではハフマン符号化）を行って、メモリ（ａ）３２にパラメータと符号データを格納する。そして、伝送路３４を介して送信側のメモリ（ａ）３２から受信側のメモリ（ｂ）３３へパラメータと符号データが伝送され、メモリ（ｂ）３３に格納される。

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【0007】受信側では、パラメータと符号データが復号化器２０内に取り込まれ、エントロピー復号化器２３で符号化テーブル３６を用いてエントロピー復号化を行い、復号化されたデータを量子化器２２で量子化テーブル３５を用いて逆量子化を行い、ＩＤＣＴ演算手段２１で逆ＤＣＴ（ＩＤＣＴ）演算を行って、画像を再生するものである（インターフェース「カラー静止画像の国際標準符号化方式」遠藤俊明著　１９９１年１２月号ｐ１６０～ｐ１８２参照）。

【0008】次に、上記構成の画像データ圧縮／伸張処理装置におけるＤＣＴ変換及びハフマン符号化について図７及び図８を用いて説明する。ＪＰＥＧ方式の画像データ圧縮／伸張処理装置ではエントロピー符号化の方式は、ハフマン符号化方式を用いている。図７は、ＤＣＴ変換の説明図であり、図８は、ハフマン符号化の説明図である。

【0009】８×８画素のブロック単位で読み込まれた原画像データは、画像データ圧縮／伸張処理装置のＤＣＴ演算手段１１において、ＤＣＴ演算を行ってＤＣＴ変換データに変換される。図７に示すように、原画像データのブロックは、６４画素の平均値（ＤＣ成分）と、平均値との差分（ＡＣ成分）の８×８の配列に変換される。図７に示したブロックでは、ＤＣ成分は２６０である。

【0010】次に、エントロピー符号化器１３において、ＤＣＴ変換されたデータに量子化を行い、複数のＤＣＴ変換データを２～１６ビットのビットパターンに置き換えるハフマン符号化を行う。ＤＣ成分については、前回（前ブロック）のＤＣ成分値（Ａ）から今回のＤＣ成分値（Ｂ）を引いた値、すなわちＡ－Ｂ（差分ＤＣ値）を使ってハフマン符号化を行う。一般に、静止画像は隣接するブロックとの平均値が大きく変化することが少ないという特性があるため、差分ＤＣ値は０に近い値となる。また、差分ＤＣ値が小さければ小さいほど圧縮効率が良い。

【0011】次に、上記構成の画像データ圧縮／伸張処理装置に原画像データを取り込む際の従来の原画像データスキャン方法について、図９を用いて具体的に説明する。図９は、従来の原画像データスキャン手段の構成ブロック図である。従来の原画像データスキャン手段は、上記画像データ圧縮／伸張処理装置４に原画像データを

８×８画素ブロック単位で出力するものであり、原画像データを一時的に格納しておく原画像メモリ３と、原画像メモリ３からデータを読み込む画像入力部２と、画像入力部２に画像データを読み込む順番（スキャン方法）を指示する制御部１とから構成されている。

【００１２】また、制御部１は、原画像データのスキャン方法を規定した原画像データスキャンプログラム１ｃを有し、原画像データスキャンプログラム１ｃを起動させて画像入力部２を制御するようになっている。

【００１３】すなわち、スキャナ等で読み取った原画像データを、一旦、原画像メモリ３に格納しておき、制御部１が、画像データスキャンプログラム１ｃを起動させて画像入力部２に指示を出し、画像入力部２は、画像データスキャンプログラム１ｃによって規定されたアドレス順に従って、原画像メモリ３から原画像データを８×８画素のブロック毎に画像データ圧縮／伸張処理装置に取り込み、上記圧縮処理を行うようになっている。

【００１４】ここで、画像データスキャンプログラム１ｃによって規定される従来の原画像データスキャン方法の概略について図１０を用いて説明する。図１０は、従来の原画像データスキャン方法を示す説明図である。従来の原画像データスキャン方法は、図１０に示すように、原画像の左上のブロックから水平方向にブロック毎にデータを読み込むようになっており、１列目のブロックの読み込みが全て終了すると、２列目のブロックを左端から読み込み、同様にして最下列右下のブロックまで順次水平方向に読み込むようになっていた。

【００１５】次に、従来の原画像データスキャン方法における原画像データスキャンプログラム１ｃの処理の流れについて、図１１，図１２を用いて説明する。図１１は、従来の原画像データスキャン方法でスキャンする原画像データのブロック構成を示す説明図であり、図１２は、従来の原画像データスキャン方法を用いて図１１の原画像データをスキャンする原画像データスキャンプログラム１ｃの処理の流れを示すフローチャート図である。尚、図１１，図１２では原画像データがｍ×ｎ個のブロックBi,j（１≦ｉ≦ｍ，１≦ｊ≦ｎ）で構成されているものとし、ブロック数ｍ，ｎは予め設定されているものとして説明している。

【００１６】従来の原画像データスキャン方法では、まずブロック数ｍ，ｎを読み込み（１００）、ｉに１を代入する（１０２）。次に、ｊに１を代入し（１１０）、ブロックBi,j を読み込み（１２０）、ｊに１を加算し（１２２）、ｊとｎとを比較し（１２４）、ｊがｎ以下の場合は処理１２０に戻ってブロックの読み込みを繰り返す。一方、処理１２４において、ｊがｎより大きい場合は、ｉに１を加算し（１３０）、ｉがｍ以下の場合は処理１１０に戻って次のブロックラインの読み込みを繰り返し、ｉがｍより大きくなったら、原画像データのスキャン処理を終了する。

【００１７】

【発明が解決しようとする課題】しかしながら、上記従来の画像データスキャン方法では、図１０に示すように、ある列の右端のブロック（ｅ）と、次の列の左端のブロック（ｆ）とは隣接していないために相関関係が無く、ブロック（ｅ）のＤＣ値からブロック（ｆ）のＤＣ値を引いた差分ＤＣ値が小さい値にならず、しかも１列のスキャンが終わる毎に相関関係が失われる現象が現れるため、画像データの圧縮効率が低下してしまうという問題点があった。

【００１８】本発明は上記実情に鑑みて為されたもので、常に隣接したブロックを読み込んでいくことにより、画像の相関関係を利用して、画像データの圧縮効率を向上させることができる原画像データスキャン方法に関する。

【００１９】

【課題を解決するための手段】上記従来例の問題点を解決するための請求項１記載の発明は、原画像データが格納された記憶部から前記原画像データをブロック単位にスキャンして前記原画像データを読み取る原画像データスキャン方法において、前記記憶部内の原画像データのブロックを特定方向と前記特定方向の逆方向に交互にスキャンすることを特徴としている。

【００２０】上記従来例の問題点を解決するための請求項２記載の発明は、原画像データが格納された記憶部から前記原画像データをブロック単位にスキャンして前記原画像データを読み取る原画像データスキャン方法において、前記記憶部内の原画像データのブロックを対角線方向に向けて前記対角線を中心に左右にジグザグにスキャンすることを特徴としている。

【００２１】

【作用】請求項１記載の発明によれば、記憶部内の原画像データのブロックを特定方向とその逆方向に交互にスキャンして原画像データをブロック単位に読み取る原画像データスキャン方法としているので、隣接しているブロックを連続して読み取ることができ、隣接ブロック間で原画像データの差が小さいためにＪＰＥＧ方式による画像圧縮過程での符号化の際の圧縮効率を向上させることができる。

【００２２】請求項２記載の発明によれば、記憶部内の原画像データのブロックを対角線方向に向けてその対角線を中心に左右にジグザグにスキャンして原画像データをブロック単位に読み取る原画像データスキャン方法としているので、隣接しているブロックを連続して読み取ることができ、隣接ブロック間で原画像データの差が小さいためにＪＰＥＧ方式による画像圧縮過程での符号化の際の圧縮効率を向上させることができる。

【００２３】

【実施例】本発明の一実施例について図面を参照しながら説明する。図１は、本発明の一実施例に係る原画像デ

ータスキャン方法を実現するための原画像データスキャン手段の構成ブロック図である。尚、図９と同様の構成をとる部分については同一の符号を付して説明する。

【００２４】本実施例の原画像データスキャン手段は、図１に示すように、従来の構成と同様な部分として制御部１と、画像入力部２と、原画像メモリ（記憶部）３とから構成されており、本実施例の特徴部分としては原画像データスキャンプログラム１ａ，１ｂが図９に示した従来の原画像データスキャンプログラム１ｃと異なって、図２又は図３に示すスキャン処理を行わせるようなプログラムとなっている。

【００２５】本実施例の原画像データスキャン手段の各部は、図９に示した従来の原画像データスキャン手段とほぼ同様であるので、本実施例の特徴部分である原画像データスキャンプログラム１ａ，１ｂでの処理を重点的に説明することにし、他の部分につては説明を省略する。尚、画像入力部２から読み取られた８×８画素のブロックは、図６に示した画像データ圧縮／伸張処理装置に取り込まれるものである。

【００２６】次に、本実施例の原画像データスキャンプログラム１ａ，１ｂについて具体的に説明する前に図２，３を使って第１，第２の実施例の原画像データスキャン方法の概略について説明する。図２は、原画像データスキャンプログラム１ａによる原画像データスキャン方法（第１の実施例の原画像データスキャン方法）を示す説明図であり、図３は、原画像データスキャンプログラム１ｂによる原画像データスキャン方法（第２の実施例の原画像データスキャン方法）を示す説明図である。

【００２７】まず、第１、第２の実施例の原画像データスキャン方法は、図２，３に示すように、隣接するブロックを断続することなく、全て連続して８×８画素のブロックを読み取って行くものである。

【００２８】また、第１、第２の実施例の原画像データスキャン方法で得られた画像データは、図６に示した画像データ圧縮／伸張処理装置で圧縮／伸張処理が為されるが、伸張した画像データも第１、第２の実施例のスキャン順と同じ順でブロック単位に表示を行う画像メモリに書き込む必要がある。これで、圧縮前の画像と同じ構成の画像を得ることができる。

【００２９】図２に示すように、第１の実施例の原画像データスキャン方法は、原画像メモリ３内の画像データを８×８画素を１ブロックとし、画像入力手段２がブロック単位に水平方向で一方向（図中右方向）にスキャンして原画像データを読み取り、水平方向のブロックを読み終えたら、次に、そのまま垂直方向（図中下方向）に１ブロック分移動して水平方向で逆方向（図中左方向）にスキャンして原画像データを読み取り、更に水平方向のブロックを読み終えたら、そのまま垂直方向（図中下方向）に１ブロック分移動して水平方向で一方向（図中右方向）にスキャンして原画像データを読み取るようになっている。これ以降の処理は、上記処理の繰り返しとなっている。

【００３０】具体的に、図１１を使って説明すると、原画像データのブロック（Bi,j）について、B1,1，B1,2，B1,3，…，B1,n とスキャンすると、次に、B2,n，B2,n-1，…，B2,1 とスキャンし、更にB3,1，B3,2，B3,3，…，B3,n とスキャンし、最終段のブロックが偶数（ｍ：偶数）であれば、Bm,n，Bm,n-1，…，Bm,1 とスキャンするものである。

【００３１】第１の実施例の原画像データスキャン方法によれば、例えば、図２の隣接しているブロック（ａ）とブロック（ｂ）を連続して読み取るようスキャンするものであるから、ＤＣハフマン符号化時にブロック（ａ）のＤＣ成分からブロック（ｂ）のＤＣ成分を引いたＤＣ成分の差分値を小さな値にすることができ、従ってそのＤＣ成分の差分値で符号化することができるため、圧縮対象のデータ量を抑えることができ、ＪＰＥＧ方式の静止画像データの圧縮効率を向上させることができる効果がある。

【００３２】尚、第１の実施例の原画像データスキャン方法では、水平方向のスキャンを基本として、水平方向のスキャンを順方向と逆方向に交互に行うようにしているが、垂直方向のスキャンを基本として、垂直方向のスキャンを順方向と逆方向に交互に行うようにしても構わない。

【００３３】図３に示すように、第２の実施例の原画像データスキャン方法は、原画像メモリ３内の画像データを８×８画素を１ブロックとし、画像入力手段２がブロック単位に図中左上から図中右下へと対角線方向に向けてその対角線を中心に左右にジグザグスキャンをしながら原画像データを読み取るようになっている。

【００３４】具体的に、図１１を使って説明すると、原画像データのブロック（Bi,j）について、B1,1，B1,2，B2,1，B3,1，B2,2，B1,3，B1,4，…，Bm-1,n，Bm,n-1，Bm,n の順でスキャンするものである。

【００３５】第２の実施例の原画像データスキャン方法によれば、例えば、図３の隣接しているブロック（ｃ）とブロック（ｄ）を連続して読み取るようスキャンするものであるから、ＤＣハフマン符号化時にブロック（ｃ）のＤＣ成分からブロック（ｄ）のＤＣ成分を引いたＤＣ成分の差分値を小さな値にすることができ、従ってそのＤＣ成分の差分値で符号化することができるため、圧縮対象のデータ量を抑えることができ、ＪＰＥＧ方式の静止画像データの圧縮効率を向上させることができる効果がある。

【００３６】次に、第１、第２の実施例の原画像データスキャン方法を実現する原画像データスキャンプログラムの処理内容について説明する。まず、第１の実施例の原画像データスキャン方法における原画像データスキャ

ンプログラム１ａの処理の流れについて、図4，図１１を用いて説明する。図4は、第1の実施例の原画像データスキャン方法を用いて、図１１の原画像データをスキャンする原画像データスキャンプログラム１ａの処理の流れを示すフローチャート図である。尚、図4では、従来と同様にブロック数m，nは予め設定されているものとして説明している。

【００３７】第1の実施例の原画像データスキャン方法では、図4に示すように、まずブロック数m，nを読み込み（２００）、iに1を代入する（２０２）。次に、右方向にスキャンする処理として、jに1を代入し（２１０）、ブロックBi,j を読み込み（２２０）、jに1を加算して（２２２）、jがnより大きいかどうか判定し（２２４）、jがn以下の場合は処理２２０に戻って右方向へのスキャンを繰り返し、jがnより大きい場合は、iに1を加算する（２３０）。

【００３８】そして、iがmより大きいかどうか判定し（２３２）、iがmより大きい場合は、原画像データのスキャン処理を終了し、iがm以下の場合は、左方向にスキャンする処理として、jにnを代入し（２４０）、ブロックBi,j を読み込み（２５０）、jから1を減算する（２５２）。次にjが1より小さいかどうか判定し（２５４）、jが1以上の場合は処理２５０に戻って左方向のスキャンを繰り返し、jが1より小さくなったら、iに1を加算する（２６０）。そして、iがmより大きいかどうか判定し（２６２）、iがm以下の場合は処理２１０に戻って次のブロックラインの右方向のスキャンを行い、iがmより大きい場合は原画像データのスキャン処理を終了する。

【００３９】次に、第2の実施例の原画像データスキャン方法における原画像データスキャンプログラム１ｂの処理の流れについて、図5，図１１を用いて説明する。図5は、第2の実施例の原画像データスキャン方法を用いて、図１１の原画像データをスキャンする原画像データスキャンプログラム１ｂの処理の流れを示すフローチャート図である。尚、図5では、従来と同様にブロック数m，nは予め設定されているものとして説明している。

【００４０】第2の実施例の原画像データスキャン方法では、まず、ブロック数m，nを読み込み（３００）、i，jに1を代入し（３０２）、ブロックBi,j を読み込む（３０４）。次に、右方向に1ブロックスキャンする処理として、jに1を加算して（３１０）、jとnとを比較し（３１２）、jがn以下の場合はブロックBi,j を読み込む（３１４）。

【００４１】次に、iの値が1であるか判断し（３１６）、iが1の場合は、左下方向にスキャンする処理として、iに1を加算しjから1を減算し（３２０）、iとmとを比較し（３２２）、iがm以下の場合は、更にjと1とを比較し（３２４）、jが1以上の場合はブロックBi,j を読み込み（３２６）、処理３２０に戻って左下方向へのスキャンを繰り返す。

【００４２】尚、処理３２２において、iがmより大きい場合は、スキャン位置が原画像データの下端に達した場合であるから、iから1を減算しjに1を加算して（３２８）スキャン位置を戻し、処理３１０に飛んで右方向に1ブロックスキャンする処理に移る。

【００４３】また、処理３２４において、jが1より小さい場合は、スキャン位置が原画像データの左端に達した場合であるから、iから1を引算しjに1を加算して（３２９）スキャン位置を戻し、処理３４０に飛んで下方向に1ブロックスキャンする処理に移る。

【００４４】そして、処理３１６において、iが1でない場合は、右上方向にスキャンする処理として、iから1を減算しjに1を加算し（３３０）、iと1とを比較し（３３２）、iが1以上の場合は更にjとnとを比較し（３３４）、jがn以下の場合はブロックBi,j を読み込み（３３６）、処理３３０に戻って右上方向へのスキャンを繰り返す。

【００４５】尚、処理３３２において、iが1より小さい場合は、スキャン位置が原画像データの上端に達した場合であるから、iに1を加算しjから1を減算して（３３８）スキャン位置を戻し、処理３１０に飛んで右方向に1ブロックスキャンする処理に移る。

【００４６】また、処理３３４において、jがnより大きい場合は、スキャン位置が原画像データの右端に達した場合であるから、iに1を加算しjから1を減算して（３３９）スキャン位置を戻し、処理３４０に飛んで下方向に1ブロックスキャンする処理に移る。

【００４７】そして、処理３１２において、jがnより大きい場合は、スキャン位置が原画像データの右端に達した場合であるから、jから1を減算して（３１３）スキャン位置を戻し、次に下方向に1ブロックスキャンする処理として、iに1を加算し（３４０）、iとmとを比較し（３４２）、iがmより大きい場合は、原画像データのスキャン処理を終了しする。

【００４８】一方、処理３４２において、iがm以下の場合は、ブロックBi,j を読み込み（３４４）、jが1の場合は、処理３３０に飛んで右上方向へスキャンする処理に移り、jが1でない場合は、処理３２０に飛んで左下方向へスキャンする処理に移る。

【００４９】本実施例の原画像データスキャン方法によれば、相関関係のある隣接ブロックを図2、図3に示すスキャン方法で連続して読み取ってＪＰＥＧ方式で圧縮処理を行うようにしているので、圧縮過程におけるＤＣハフマン符号化時にＤＣ成分の差分値を小さな値にできるため、圧縮効率を向上させることができる効果がある。

【００５０】

【発明の効果】請求項１記載の発明によれば、記憶部内

の原画像データのブロックを特定方向とその逆方向に交互にスキャンして原画像データをブロック単位に読み取る原画像データスキャン方法としているので、隣接しているブロックを連続して読み取ることができ、隣接ブロック間で原画像データの差が小さいためにＪＰＥＧ方式による画像圧縮過程での符号化の際の圧縮効率を向上させることができる効果がある。

【００５１】請求項２記載の発明によれば、記憶部内の原画像データのブロックを対角線方向に向けてその対角線を中心に左右にジグザグにスキャンして原画像データをブロック単位に読み取る原画像データスキャン方法としているので、隣接しているブロックを連続して読み取ることができ、隣接ブロック間で原画像データの差が小さいためにＪＰＥＧ方式による画像圧縮過程での符号化の際の圧縮効率を向上させることができる効果がある。

【図面の簡単な説明】

【図１】本発明の一実施例に係る原画像データスキャン手段の構成ブロック図である。

【図２】第１の実施例の原画像データスキャン方法を示す説明図である。

【図３】第２の実施例の原画像データスキャン方法を示す説明図である。

【図４】第１の実施例の原画像データスキャン方法を用いて、図１１の原画像データをスキャンする原画像データスキャンプログラム１ａの処理の流れを示すフローチャート図である。

【図５】第２の実施例の原画像データスキャン方法を用いて、図１１の原画像データをスキャンする原画像データスキャンプログラム１ｂの処理の流れを示すフローチャート図である。

【図６】ＪＰＥＧ方式の画像データ圧縮／伸張処理装置の構成ブロック図である。

【図７】ＤＣＴ変換の説明図である。

【図８】ハフマン符号化の説明図である。

【図９】従来の原画像データスキャン手段の構成ブロック図である。

【図１０】従来の原画像データスキャン方法を示す説明図である。

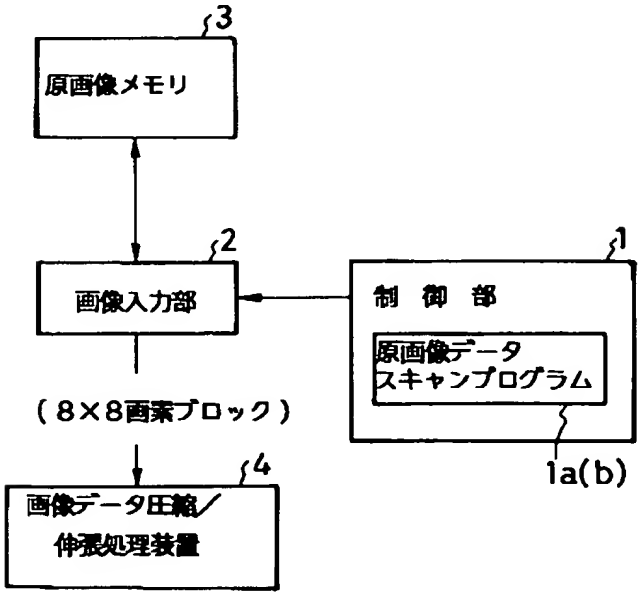
【図１１】従来の原画像データスキャン方法でスキャンする原画像データのブロック構成を示す説明図である。

【図１２】従来の原画像データスキャン方法を用いて図１１の原画像データをスキャンする原画像データスキャンプログラム１ｃの処理の流れを示すフローチャート図である。

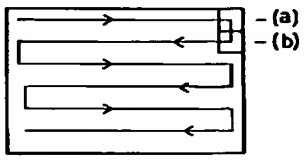
【符号の説明】

１…制御部、　１ａ，１ｂ，１ｃ…原画像データスキャンプログラム　２…画像入力部、　３…原画像メモリ、　４…画像データ圧縮／伸張処理装置、　１０…符号化器、　１１…ＤＣＴ演算手段、　１２…量子化器、　１３…エントロピー符号化器、　２０…復号化器、　２１…逆ＤＣＴ演算手段、　２２…量子化器、　２３…エントロピー復号化器、　３２…メモリ（ａ）、　３３…メモリ（ｂ）、　３４…伝送路、　３５…量子化テーブル、　３６…符号化テーブル

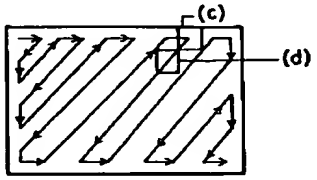
【図1】



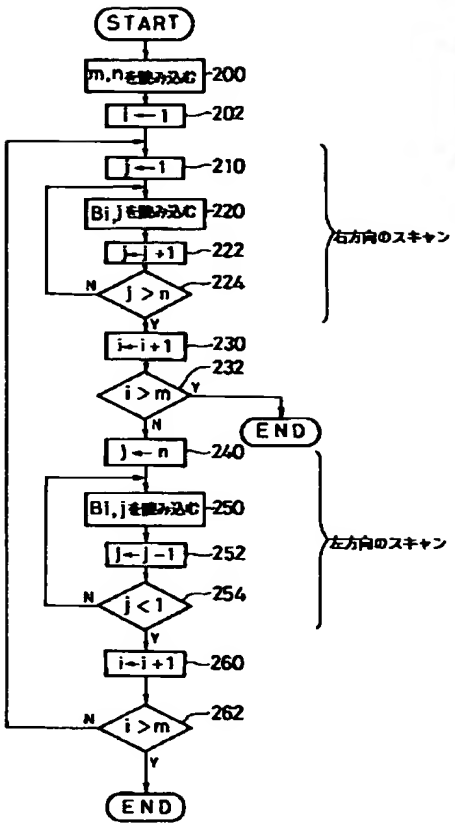
【図2】



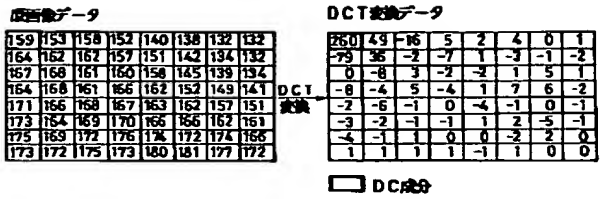
【図3】



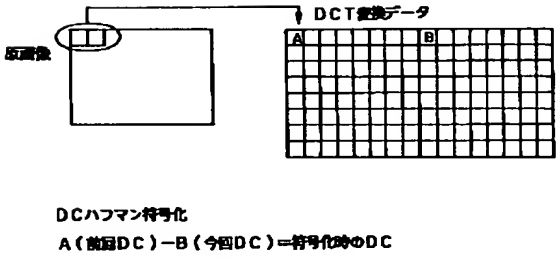
【図4】



【図7】



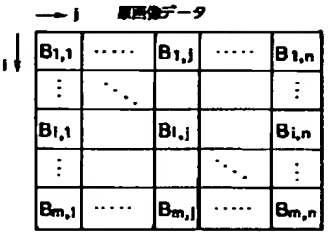
【図8】



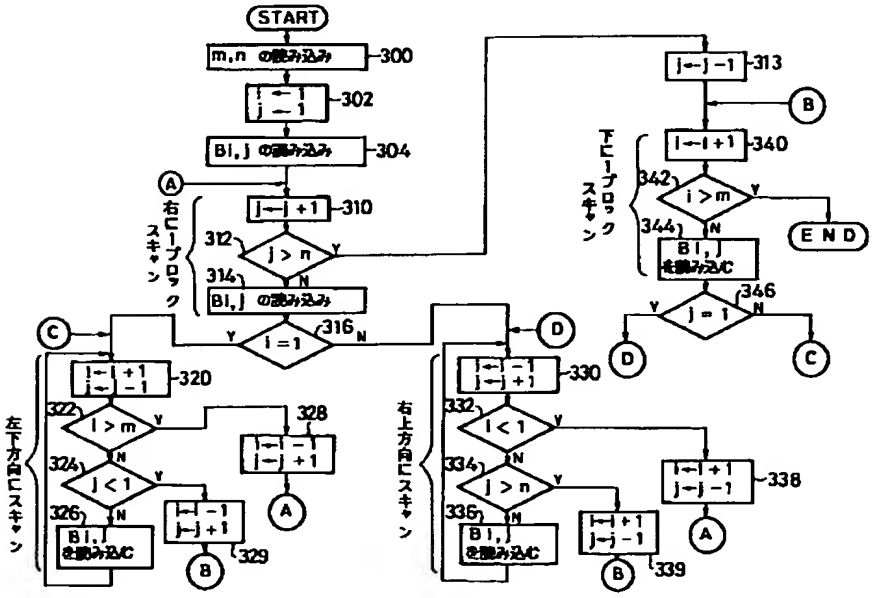
DCハフマン符号化

A（前回DC）－B（今回DC）＝符号化時のDC

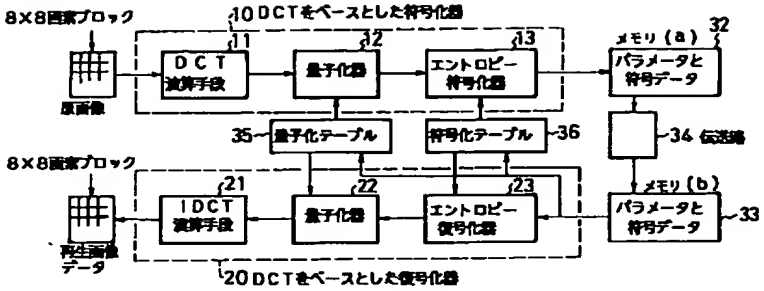
【図11】



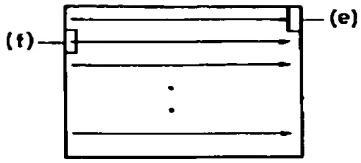
【図5】



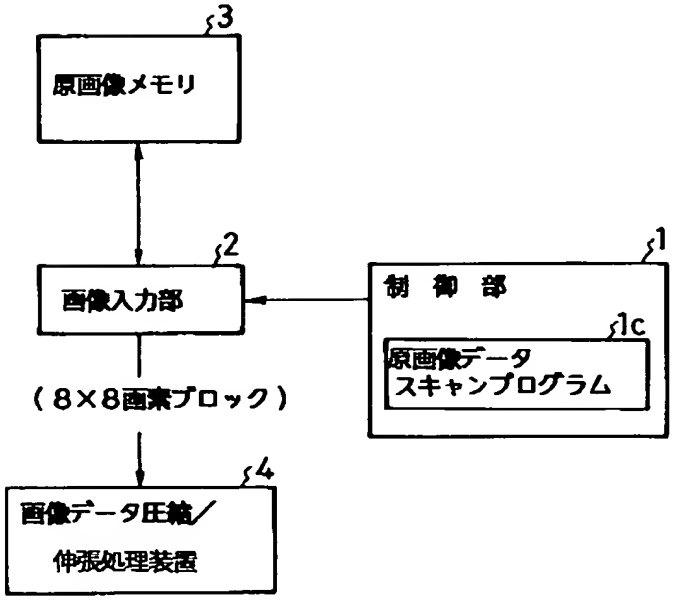
【図6】



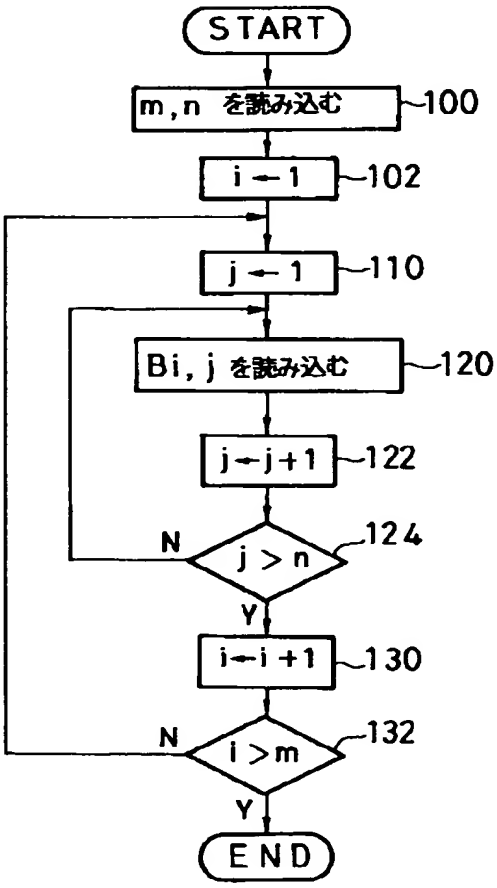
【図10】



【図9】



【図12】



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	7/40		8842－5J		